The Review of Higher Education
Fall 2012, Volume 36, No. 1, pp. 51–90
 (ISSN 0162-5748)

The Impact of State Appropriations and Grants on Access to Higher Education and Outmigration

Robert K. Toutkoushian and Nicholas W. Hillman

Introduction

Education policymakers at all levels of government have long been interested in finding ways to entice more students to go to college. This goal has been driven by the belief that, as people acquire more education, they not only reap personal benefits from their investment in education, but they also create spillover benefits for others in society (referred to by economists as "positive externalities") in ways such as raising their community's standard of living, reducing crime rates, and enhancing the region's quality of life

ROBERT K. TOUTKOUSHIAN is a Professor at the Institute of Higher Education, University of Georgia. NICHOLAS W. HILLMAN is an Assistant Professor in the College of Education at the University of Utah. Earlier versions of this paper were presented at the annual meeting of the American Educational Research Association, San Diego, California, April 14–18, 2009, at the Association for the Study of Higher Education, Jacksonville, Florida, November 5–8, 2008, and the workshop series in the Department of Economics at the University of Georgia on March 24, 2011. ACKNOWLEDGEMENTS: We would like to thank John Cheslock, Don Hossler, Don Heller, Erik Ness, Michael Paulsen, Liang Zhang, and two anonymous referees for comments on earlier drafts of this paper. Address queries to Robert Toutkoushian, Institute of Higher Education, Meigs Hall 114, University of Georgia, Athens, GA 30602, telephone: (706) 542–0577; fax: (706) 542–7588; email: rtoutkou@uga.edu.

(Blundell, Dearden, Goodman, & Reed, 2000; Dee, 2003; McMahon, 2009; Moretti, 2004; Venniker, 2000). Accordingly, governments hope that increases in the college-going rate will raise both pecuniary and non-pecuniary gains for their region.

The challenge facing governments is how to entice more students to acquire a postsecondary education so that a socially optimum number of students in the region attend college. The theory of investment in human capital (Mincer, 1958) holds that students make decisions about their level of education based on estimates of the private costs of and benefits from going to college. As a result, governments may introduce policies (such as financial subsidies to students or to designated postsecondary institutions) that reduce the private cost to students of investing in human capital, which in turn would cause some students who were at the margin for attending college to conclude that it is now in their best interest to pursue a postsecondary education. Another way to reap these positive externalities is for governments to convince more residents to stay in their region for some period of time; otherwise, the spill-over benefits from the financial support for higher education would accrue to the regions where the students migrate.

State governments play an important role in providing funding for higher education, with more than $75 billion being appropriated for postsecondary education in 2009–2010 (Grapevine, 2010). The way in which states finance higher education, however, differs substantially from the federal approach. The federal government relies primarily on grants to faculty to support basic research and on need-based grants to students that can be used at institutions across the United States. In contrast, states on average provide more than 90% of their assistance to designated (typically public) colleges and universities in the form of appropriations. (See Tables 1 and 3.) The hope among policymakers is that colleges will use a portion of appropriations to reduce the tuition rates charged to state residents and thus make college more affordable for them. While state appropriations generally kept pace with inflation during this time (Grapevine, 2010), they have accounted for an increasingly smaller share of total expenditures on college campuses (Heller, 2006). Winston's (1999) notion that price is equal to cost minus subsidies in higher education helps explain why tuition rates have risen faster than inflation for the last decade (College Board, 2010), leading to concern that higher education will become less affordable to many students (see also Bound & Turner, 2007). This relationship between tuition and appropriations is complex (Calhoun & Kamerschen, 2010), and Rizzo (2006) and Koshal and Koshal (2000) found that, when state funding is constrained, tuition rates increase.

In addition to appropriations, however, states also provide financial assistance directly to students in the form of either need-based grants or merit-based grants. Need-based grants are given to state residents based on their income levels and ability to pay for college, while merit-based grants

are awarded primarily on measures of academic performance such as grade point average or standardized test scores. One important difference between the state and federal approaches to grants is that states usually restrict the funds to be used at institutions within the state's boundaries to reduce out-migration, whereas federal grants are portable across state lines. There is a wide range of need-based and merit-based state grant programs in place throughout the United States. In 2008, all 50 states awarded some financial assistance to students in the form of need-based grants, with the dollar amounts ranging from a high of more than $875 million (California) to a low of $163,000 (Wyoming).

Similarly, in 2008, 42 states awarded at least some financial assistance to students on the basis of merit. These programs vary in terms of the criteria for eligibility for receiving aid, the size of the grant, the institutions where the grants can be used, and whether aid is contingent on academic performance in college or other stipulations. Delaney and Ness (2010) have recently developed a more complete typology of state merit aid programs that is helpful for understanding how these programs differ across the United States. A further complexity is that some state grant programs have both a merit and a need component. For example, eligibility in the Twenty-first Century Scholars program in Indiana is limited to students who are both low income (need) and who have a C average or better in high school (merit). Despite these nuances, state aid programs tend to be categorized as either "merit-based" or "need-based" by agencies such as the National Association of State Scholarship and Grant Aid Programs (NASSGAP).

States have chosen different approaches to using these three mechanisms to financially support higher education. As shown by Toutkoushian and Shafiq (2010), North Carolina, New Mexico, and New Jersey can be described as "high financial aid and high appropriation" states because their per-pupil amounts for each exceed the national averages. At the other extreme, New Hampshire, Massachusetts, and Oregon are states with both low per-pupil appropriations and financial aid.

An important trend in the last 10 to 15 years, however, is that states generally have been allocating more financial support for higher education directly to students in the form of need-based and merit-based grants/scholarships and loans (Heller, 2006). In particular, since 1993, 17 states have implemented broad-based merit-aid programs in which financial assistance is given to large numbers of students who meet performance targets. These broad-based aid programs typically have lower performance criteria than are used in smaller and more selective state merit aid programs. For example, the broad-based merit aid program in Arkansas only requires students to attain a high school GPA of 2.50, which enables approximately 60% of state students to potentially qualify for the grant (Dynarski, 2004). Despite the widespread attention—and concern—that has been given to the growth of broad-based programs such

as Georgia's HOPE scholarship, state grants represent only a relatively small share of total state support for higher education.

It is not clear which of these three forms of state financial assistance for higher education—appropriations, need-based grants, or merit-based grants—is most effective in enticing students to go to college and stay in-state for their postsecondary education. Some (Heller & Marin, 2002; Toutkoushian & Shafiq, 2010) contend that, if given to the right students, need-based financial aid should be a better means than appropriations for increasing the college-going rate in states because more students who benefit from appropriations would have gone to college without the aid. However, Toutkoushian and Shafiq (2010) and Doyle (2007a, 2007b) note that it can be difficult to properly target state need-based grants at those who would most benefit from them. Likewise, because higher-achieving students should be more likely than lower-achieving students to go to college without financial aid, there is concern that merit-based aid programs would be less effective than need-based grants at increasing the college-going rate. A counter argument can be made, however, that merit aid programs provide students with an incentive to increase their academic performance, which would then lead more students to go to college (Dynarski, 2004).

The question of how state governments can best utilize financial policy to generate and retain positive externalities is very important for many higher education stakeholders. As noted by Perna and Titus (2004), "Policymakers and researchers disagree about the most appropriate balance between direct appropriations to institutions to reduce the sticker price and support to students through financial aid" (p. 503). It is therefore surprising that little empirical attention has been given to the relative impacts of these three forms of state support (Doyle, 2006, 2007a; Hearn & Longanecker, 1985; Perna & Titus, 2004). Despite Dynarski's (2004) observation that "subsidies for college students have historically taken the form of low tuition at public colleges and universities" (p. 63) and Long's (2004) description of appropriations as a form of in-kind subsidy, appropriations are often ignored in discussions of state financial support to students. The studies that have appeared in the literature usually focus on one form of state funding without considering the effects of the other options that states could use to achieve their goal. For example, while studies of broad-based state merit aid programs (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2004; Zhang & Ness, 2010) have improved our understanding of how the introduction of these programs affect student behavior, they did not compare and contrast the effects of these programs with appropriations and need-based grants. Other studies such as Heller (1999) and St. John, Chung, Musoba, and Simmons (2006) could not adequately study merit aid programs because they examined years prior to their implementation.

Studies of state financing should focus attention both on access to higher education, as measured by the percentage of high school graduates going on to college, and on the outmigration of students, as captured by the percentage of students going out of state for college. Each facet is important to state policymakers because a state must entice more students to go to college and compel more students to stay in the state for some period of time to benefit from their investment. Although Cornwell, Mustard, and Sridhar (2006), Zhang and Ness (2010), and several others examined the effects of aid on both access and migration, other studies restricted their analysis to overall access to higher education regardless of migration.

Finally, it is important to consider how the various forms of state financial assistance affect the types of postsecondary institutions students attend. The effects of different state options on student choice could depend on whether financing is in the form of an in-kind subsidy (as is true for appropriations and many need-based and merit-based grants) and where the subsidy can be used. Some grants may be restricted to four-year institutions, for example, and assistance that covers the full tuition at either a two-year or four-year institution will translate into different dollar subsidies to those who attend two-year and four-year institutions, which can then affect student choice between the two sectors.

In this study, we use panel data for all 50 states from 1988 to 2008 and a fixed effects/difference-in-difference strategy to examine how increases within states in appropriations, need-based grants, and merit-based grants affect student enrollment in college and their migration to other states for postsecondary education. We consider the impacts of these and selected socioeconomic and demographic factors on enrollment rates in four-year institutions as well as two- and four-year institutions combined, and estimate the effects both of dollars allocated to financial assistance and of the presence of broad-based merit aid programs in states.

We found that increases within states in appropriations and merit-based grants had positive and significant impacts on the overall college-going rates in states, with the dollar impact of merit-based grants being substantially larger than the effect of appropriations. Our findings also revealed that merit-based grants reduced the outmigration of students for their postsecondary education and that both the dollar expenditures on merit aid programs and the introduction of a broad-based aid program had significant effects on access to higher education. In contrast, we found no evidence that changes in the level of need-based grants affected the college-going rate of students or their migration decisions for college.

The article is organized in four sections. First, we review the literature on the effects of state financial support on access to higher education and student migration. We then describe the panel dataset that we assembled for this study and the empirical strategy that we used to estimate the key parameters in

the models. Due to the time-series, cross-sectional nature of the dataset, we tested and corrected for the presence of autocorrelation in all of our models. Third, we present the findings for overall access to higher education, and in-state versus out-of-state college attendance. Finally, we conclude with a summary of the key findings and a discussion of the implications of these results and directions for future study.

Literature Review

A significant amount of attention has been given to explaining how students make decisions about postsecondary education. As summarized in a number of literature reviews (Becker, 1990; Heller, 1997; Jackson & Weathersby, 1975; Leslie & Brinkman, 1987), student demand studies often use the investment in human capital framework to examine how changes in the costs and benefits of college affect students. The variables in these studies (such as financial aid and family income) are selected on the basis of whether they may affect the costs of going to college, the benefits of going to college, or the preferences that students may receive from going to college. Studies typically have better data on measures relating to the cost of investing in human capital and the preferences of students for going to college than data on the financial benefits from going to college. The main interest of many of these studies was to measure price elasticity of demand for higher education. The general consensus of this literature is that the demand for higher education tends to be relatively inelastic, although the demand is likely more elastic for specific institutions.

A subset of studies on this topic explored the factors that affect student migration decisions for college (Adkisson & Peach, 2008; Baryla & Dotterweich, 2001, 2006; Curs & Singell, 2002; Dotterweich & Baryla, 2005; Greene, 1994; Groen & White, 2004; Kyung, 1996; Mak & Moncur, 2003; McHugh & Morgan, 1984; Mixon, 1992; Mixon & Hsing, 1994a, 1994b; Noorbakhsh & Culp, 2002; Orsuwan & Heck, 2009; Rizzo & Ehrenberg, 2004; Zhang, 2007). These studies focused primarily on the impact of pricing, institutional reputation, and distance on students' decision to migrate to other states for their postsecondary education. The migration studies focus on factors that may affect why students leave their particular state for their postsecondary education and why states or institutions would be willing to enroll them. Mixon's (1992) study showed that student outmigration is higher in states with lower-reputation institutions, and Kyung (1996) found that demand for a particular out-of-state institution decreases with distance to the institution. In two empirical studies including both public and private institutions, Mixon and Hsing (1994a, 1994b) identified a positive relationship between nonresident tuition and enrollment levels. Baryla and Dotterweich (2001) found no overall relationship between nonresident tuition and enrollments

and also found that nonresident students were attracted to higher-quality institutions.

Governments have traditionally been major sponsors of higher education. Economists attribute governmental financial support for research activities to the notion that basic research is essentially a "public good" for society and thus subsidies might be needed to help encourage its production. With regard to the teaching mission of postsecondary institutions, it has been argued that education leads to spillover benefits, or positive externalities, for society (Blundell, Dearden, Goodman, & Reed, 2000; Creedy & Francois, 1990; Moretti, 2004; Paulsen, 2001; Venniker, 2000). The positive externalities from higher education might include pecuniary benefits from higher taxes paid and contributions to the standard of living in their community as individuals acquire skills that are rewarded in the labor market, plus nonpecuniary benefits such as improved civic participation and reduced crime rates (Dee, 2003; McMahon, 2009).[1] According to the investment in human capital model, students take into account only their private financial benefits and costs, and their underlying preference for going to college, when making decisions about whether to acquire more education (Becker, 1975; Mincer, 1958; Schultz, 1961). To reach the socially optimal level of enrollments for a region, governmental financial support for higher education is therefore needed to entice some students to go to college who might otherwise not do so by reducing their private cost of investing in human capital. This reduction can be accomplished by either subsidizing institutions that will then reduce the price they charge to residents or by giving money directly to students to offset tuition.

If the state's objective is to provide financial support to maximize positive externalities for the state, then the best strategy would be to design policies that convince more students both to go to college and also to spend some time in the state during and/or after their postsecondary education. For example, if a state is successful at helping more students go to college but these students move to other states following receipt of aid, then the positive externalities the students create will follow them. For this reason, states usually rely on in-kind aid programs so that the financial assistance must be used at an institution within state boundaries. This restriction applies not

[1]Although we focus on the goal of maximizing positive externalities to explain state behavior, we acknowledge that there are other models and theories that have also been used to describe governmental support for higher education. The median voter model, for example, posits that lawmakers act in ways aimed at appeasing the average, or median, voter in their regions. In this model, government support for higher education mirrors the preferences of voters; hence, programs such as appropriations that benefit larger numbers of voters than need-based grants would tend to be more highly supported, according to this theory. It has also been argued that competing interest groups have an effect on the level and form of governmental support for higher education.

only to merit-based and need-based grants but also to appropriations that are used to reduce the tuition rates charged to state residents. Policymakers hope that, if a student stays in state for college, then the state will gain positive externalities while the student receives an education. This approach is supported by a number of studies that have shown that students are more likely to live in the state following graduation (Groen, 2004; Ionescu & Polgreen, 2009; Kodrzycki, 2001; Perry, 2001) and thus provide even greater positive externalities to the state in the future.

The literature on the effects of state financial support on access to and migration in higher education consists of studies that vary in several important ways. First, studies differ in the unit of analysis used to investigate the effects of financial support on student enrollment decisions. Some studies, such as Kane (2003), van Der Klaauw (2002), Perna and Titus (2004), Dynarski (2004), Long (2004), and DesJardins and McCall (2006, 2009), used longitudinal data about students to determine whether the level and type of aid received affected the postsecondary choices of students.

This literature has been particularly important for the field of higher education because it provides examples of how to correct for the fact that the receipt of financial aid is usually endogenous and correlated with omitted/unobservable factors that can also influence student choice. For example, more highly motivated students may be more likely both to receive financial aid and also to go to college. Unobservable factors such as motivation that may be positively correlated with both aid and demand could lead to an upward bias in estimates of the effect of aid on demand. Student-level studies such as those cited above attempt to correct for this problem by using a variety of techniques such as regression discontinuity, propensity score matching, instrumental variables, or natural experiments (Becker, 2003; Cellini, 2008; DesJardins, Ahlburg, & McCall, 2006).

Other studies have used state-level data to study how changes in state financial support have impacted student choice (Heller, 1999; Mak & Moncur, 2003; Cornwell, Mustard, & Sridhar, 2006; St. John, Chung, Musoba, & Simmons, 2006; Zhang & Ness, 2010). Most state-level studies relied on panel data research designs to expand the sample size, used fixed effects estimation to remove the influence of unobservable factors that can affect student choice, and employed a difference-in-difference statistical approach to test for whether the introduction of a broad-based merit aid program led to an increase in student demand within a state. Broad-based merit aid programs are treated as natural experiments because the program represents an exogenous policy shift that affected a particular group of students (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2002a).

A second defining feature of state aid studies is that they vary in terms of the type of state aid examined. It is most common for recent studies in this line of inquiry to focus on the effects of merit-based grants on student

choice (Cornwell, Mustard, & Sridhar, 2006; Dynarski, 2000, 2004; Kane, 2003; Mak & Moncur, 2003; St. John, Chung, Musoba, & Simmons, 2006; Zhang & Ness, 2010). Merit-based grants have received considerable attention from analysts because such programs have been adopted by 17 states since 1993, and concerns have been raised that these programs are inefficient and inequitable because they divert financial support toward students who are already predisposed to going to college (Heller, 2006). However, as noted by Dynarski (2004), broad-based merit aid programs are different from other merit-based grants in that they seek to help a large number of students and are more geared toward improving access. States may also benefit from merit aid programs if they are successful in convincing more high-ability students to attend an in-state college.

Studies by Cornwell, Mustard, and Sridhar (2006), Zhang and Ness (2010), Mak and Moncur (2003), and Dynarski (2002a), examined the impact of merit aid on student demand by including a dummy variable for years in which broad-based merit aid programs were in effect. However, other researchers—including Heller (1999) and St. John, Chung, Musoba, and Simmons (2006)—instead used the dollars of merit aid per student, which captured merit aid from all state sources including broad-based programs as well as the relative size of the grant program.

Some research focused attention on need-based financial aid (Heller, 1999; Perna & Titus, 2004; St. John, Chung, Musoba, & Simmons, 2006). The interest among researchers in need-based aid is often justified on the grounds that such programs are intentionally targeted toward improving access to higher education for students from low-income families. Toutkoushian and Shafiq (2010) discussed how, in theory, need-based grants could be more effective than appropriations at raising the college-going rate of students if the aid can be targeted to only those students who would be less likely go to college without the aid. In contrast, the financial benefit from state appropriations is given to all residents who attend a public, in-state institution regardless of their ability to pay for college. The results from empirical studies of need-based aid, however, have been mixed with regard to whether increases in need-based grants lead to higher college participation rates (Goldrick-Rab, Harris, & Trostel, 2009 ; Perna & Titus, 2004; St. John, Chung, Musoba, & Simmons, 2006).

Turning to the final form of state support for higher education—appropriations—there have been relatively few investigations that have examined their impact on access to college or student migration (Mak & Moncur, 2003; Perna & Titus, 2004). Perna and Titus (2004) found that both state appropriations and need-based grants had positive effects on college attendance. A few studies (Heller, 1999; St. John, Chung, Musoba, & Simmons, 2006) did not control for appropriations but instead included in-state public tuition rates as an independent variable in their models. The argument in

TABLE 1

DESCRIPTIVE STATISTICS

Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
PctPost	55.7%	9.0%	16.3%	78.7%
PctPostI	43.3%	10.0%	7.7%	72.9%
PctPostO	12.4%	6.9%	2.9%	33.2%
PctPost4Yr	39.5%	8.3%	12.9%	58.3%
PctPost4YrI	28.1%	7.8%	3.4%	46.8%
PctPost4YrO	11.4%	6.7%	1.6%	32.6%
PctBA	24.3%	5.2%	11.1%	43.2%
PctBlack	11.9%	10.9%	0.0%	59.6%
PctHisp	9.5%	10.5%	0.6%	51.0%
MedianY	$23,147	$3,708	$14,448	$33,759
Fin	$2,826	$719	$1,083	$6,078
FinA	$2,671	$705	$1,065	$6,075
FinN	$114	$115	$0	$560
FinM	$42	$94	$0	$614
PctN	4.2%	4.2%	0.0%	19.5%
PctM	1.3%	2.8%	0.0%	19.5%
BBMerit	0.158	0.365	0	1

Notes: There are 500 observations for each variable. Data are for even-numbered years 1988 and 1992 through 2008 for the 50 states. All financial variables have been adjusted for inflation (base year = 2008). *PctPost* = percentage of students attending any postsecondary institution. *PctPostI* = percentage of students attending any in-state postsecondary institution. *PctPostO* = percentage of students attending any out-of-state postsecondary institution. *PctPost4Yr* = percentage of students attending any four-year postsecondary institution. *PctPost4YrI* = percentage of students attending any in-state four-year postsecondary institution. *PctPost4YrO* = percentage of students attending any out-of-state four-year postsecondary institution. *PctBA* = percentage of adult population with a bachelor's degree or higher. *PctBlack* = percentage of state population ages 18–24 who are Black. *PctHisp* = percentage of state population ages 18–24 who are Hispanic. *MedianY* = median household income. *Fin* = total state financial assistance per capita ages 18–24 for higher education. *FinA* = state appropriations per capita ages 18–24. *FinN* = state need-based grants per capita ages 18–24. *FinM* = state merit-based grants per capita ages 18–24. *PctN* = percentage of total state funding in need-based grants. *PctM* = percentage of total state funding in merit-based grans. *BBMerit* = number of states with broad-based merit-aid programs.

favor of this approach would be that this variable should, in part, capture the effect of appropriations because they help lower tuition rates for residents. However, this approach has its limitations because states and institutions can vary considerably in the extent to which appropriations reduce tuition rates. Likely many factors in addition to appropriations can affect tuition, and using tuition to explain enrollments raises concerns about the simultaneity between tuition and enrollments (Calhoun & Kamerschen, 2010).

The empirical studies on state financial support can also be grouped according to whether they focused on access to higher education or student outmigration. Because policymakers have long viewed financial support as

a means of enticing more students to go to college, it is not surprising that most attention in the literature has been paid to whether state financial support raises college enrollment rates. Studies that have exclusively examined access to higher education as the dependent variable of interest (Dynarski, 2002a, 2004; Heller, 1999; Kane, 2003; St. John, Chung, Musoba, & Simmons, 2006), while other studies (Cornwell, Mustard, & Sridhar, 2006; Perna & Titus, 2004; Zhang & Ness, 2010) have focused on the impact of state financing on both access to higher education and student outmigration.

There are, however, several important gaps in the current literature on the effects of state financial aid policy on students. First, no study has focused on comparing the relative impacts on students of all three forms of state financial support for higher education. Researchers typically treat appropriations as being separate from need-based and merit-based grants even though all three are mechanisms by which states can try to increase access and reduce mobility. The relative impacts of appropriations and grants—both need-based and merit-based—on students, and whether each form has an effect on students holding the other two constant, should be of great interest to state policymakers who have to decide how to allocate their financial resources between them. Second, no study has examined whether the level of financial assistance or the presence of broad-based financial aid has the largest impact on student access and mobility. Researchers have traditionally examined one or the other but not both at the same time. Finally, much of the literature on state financial policy is now in need of updating. This factor is particularly important because several of the main studies in the field took place prior to the significant growth of broad-based merit-aid programs.

Data and Methodology

For this study, we compiled a panel dataset of information for all 50 states for 1988 and all even-numbered years from 1992 to 2008. The final dataset contained 500 observations. We relied on several sources of information to construct the variables used in this study. We used the *Digest of Education Statistics* produced by the National Center for Education Statistics (selected years) to determine the numbers of recent high school graduates who attended postsecondary institutions either in their state of residence or out of state for the even-numbered years 1992 to 2008. Because the *Digest of Education Statistics* did not include similar counts for 1988, we calculated these quantities by summing institutional enrollments by residency status from the Integrated Postsecondary Education Data System (IPEDS). We obtained data from the U.S. Census Bureau on the median family income, population estimates by race/ethnicity and age, and educational attainment of adults by state. The Western Interstate Commission for Higher Education (WICHE) was the source of data we used on public and private high school graduates

by state and year. We relied on Grapevine (2010) for information on the annual state appropriations by state for higher education. Finally, the National Association of State Scholarship and Grant Aid Programs (NASSGAP) was the source of information on state need-based and merit-based financial aid by year and state. (For a more complete description of the variables and data sources, see the Appendix.)

A number of advantages should be noted from our use of a panel dataset for this study. First, the panel dataset allowed us to simultaneously examine and control for time-series and cross-sectional changes in the college-going behavior of high school graduates. Second, because cross-sectional studies of state-level data are adversely affected by having too few degrees of freedom, the panel dataset substantially increased the sample size that we could use to estimate the parameters in the statistical models. Third, the fixed effects estimation method enabled us to control for unobservable state characteristics that are constant over the sample period but which impact on the college-going rates of students in each state. For these reasons, panel datasets are becoming increasingly popular in empirical studies in the field of higher education for conducting state-level studies. For mathematical and statistical details of fixed effects and random effects estimators, see Greene (1997) and Wooldridge (2002).

Dependent Variables

In this study, we examined six different dependent variables that all represent the college-going rates of high school graduates. In each instance, we constructed the variable by comparing the number of high school graduates enrolled in a certain type of institution to the number of high school graduates (public and private) in the year in question. The first dependent variable was the percentage of high school graduates from each state who enrolled in any public or private two-year or four-year postsecondary institution within twelve months of graduation (*PctPost*). The second and third dependent variables that we constructed were the percentages of graduating seniors who enrolled at a two-year or four-year institution in their home state (*PctPostI*) or in another state (*PctPostO*). The final three dependent variables (*PctPost4Yr, PctPost4YrI, PctPost4YrO*) were defined in similar ways to the first three variables, except that the numerators included only enrollments in four-year institutions.

Because institutions are required to submit data to the federal government only on how many graduating seniors stayed in-state or went out-of-state for college in even-numbered years, we had to restrict our analysis to even-numbered years. Beginning in 2001, it became optional for institutions to report data on student migration in odd-numbered years to the National Center for Education Statistics. However, we found that the institutional response rates for odd-numbered years were substantially lower than for

even-numbered years and therefore believe that the college attendance and migration rates in odd-numbered years would be biased downward. For this reason, we excluded odd-numbered years from 2001 onward from our study. We excluded 1986—the first year for which migration data were collected—due to the excessive number of institutions with missing data. Finally, we could not include 1990 in our analysis because the NCES does not report enrollment data for institutions in this year.

Independent Variables

We identified a series of independent variables that the investment in human capital model and the empirical literature on higher education suggest could influence the college-going rates of students. The investment in human capital model holds that student decisions about postsecondary education are affected by the financial cost of going to college, the financial benefits of going to college, and the preferences (utility) that students receive from going to college. The variables that we use can be grouped into factors that affect cost and the preferences for college. Although we did not have data on measures of the financial benefit from attending college within each state, the fixed effects estimation would capture the net effects of benefits and other factors that were constant within each state over the time period of our study.

First, according to the investment in human capital model, the ability of students to pay for college can affect the postsecondary aspirations and choices of students. To capture this construct, we created a variable for the median household income in each state (*MedianY*). The median household income was adjusted for inflation using the Consumer Price Index (base year 2008). It is also possible that, through the investment in human capital model, some groups of students would have higher or lower preferences for going to college, holding constant their expected benefits and costs of college. Accordingly, we included variables in our models for the percentage of the population 25 years of age and older with a bachelor's degree (*PctBA*), and the percentages of the population ages 18–24 that were Black (*PctBlack*) or Hispanic (*PctHisp*).

We also obtained data on the poverty rate of adults in each state but found no material differences in the results from our analyses when we replaced median household income with the poverty rate. To control for time fixed effects on college-going rates, we created a series of dummy variables (T_1 to T_9) for the even-numbered years 1992 to 2008. Similarly, we constructed a set of 50 dummy variables for states (S_1 to S_{50}) to control for state fixed effects in our models.

Finally, we created several additional variables to test the main conjectures in this study about the impact of state financial support on student access to higher education and outmigration. The investment in human capital model predicts that increases in financial assistance would lower the private cost

of attending college, resulting in a greater propensity to attend college. The first variable represented the total state financial assistance per capita that was given to higher education (*Fin*). This variable was defined as the sum of state appropriations, need-based grants, and merit-based grants in each year, divided by the state's population ages 18–24. Similarly, we constructed variables for per-capita state appropriations (*FinA*), per-capita state need-based grants (*FinN*), and per-capita state merit-based grants (*FinM*). We expressed these metrics in per-capita dollars to standardize comparisons in funding across states and to provide approximate measures of financial support for college-aged residents in each state. All four state funding variables were adjusted for inflation using the Consumer Price Index (base year 2008).

We also created variables to represent the percentage of total state funding in the form of need-based grants (*PctN*) or merit-based grants (*PctM*). The final state finance variable used here was a dichotomous variable equal to 1 if the state had a broad-based, merit aid grant program in the year in question (*BBMerit*), and 0 otherwise.[2] To examine how the form and level of state financial assistance affected access to higher education and state migration, we used fixed effects models to estimate the key parameters in the model.[3] The four alternative model specifications that we applied to each dependent variable were as follows:

$$(1)\ Y_{it} = S_i\alpha + T_t\beta + SES_{it}\delta + DEM_{it}\gamma + \lambda_1 Fin_{it} + \lambda_2 PctN_{it} + \lambda_3 PctM_{it} + u_{it}$$

$$(2)\ Y_{it} = S_i\alpha + T_t\beta + SES_{it}\delta + DEM_{it}\gamma + \lambda_4 FinA_{it} + \lambda_5 FinN_{it} + \lambda_6 FinM_{it} + u_{it}$$

$$(3)\ Y_{it} = S_i\alpha + T_t\beta + SES_{it}\delta + DEM_{it}\gamma + \lambda_1 Fin_{it} + \lambda_7 BBMerit_{it} + u_{it}$$

$$(4)\ Y_{it} = S_i\alpha + T_t\beta + SES_{it}\delta + DEM_{it}\gamma + \lambda_4 FinA_{it} + \lambda_5 FinN_{it} + \lambda_6 FinM_{it} + \lambda_7 BBMerit_{it} + u_{it}$$

where the dependent variable Y = percentage of high school graduates in state i and year t enrolling in a two-year or four-year postsecondary education (*PctPost*, *PctPostI*, *PctPostO*), or only a four-year postsecondary institution

[2]The following states adopted broad-based merit aid programs during the time span of our study: Georgia (1993), Mississippi (1995), New Mexico (1996), Florida (1997), Missouri (1997), Kentucky (1998), Louisiana (1998), Alaska (1999), Nevada (1999), Michigan (2000), South Carolina (2001), West Virginia (2002), Tennessee (2003), South Dakota (2003), Massachusetts (2006), and Wyoming (2006). A 17th state, Arkansas, introduced a broad-based merit aid program in 2010, but we could not include this program in our analysis due to the date of its implementation (Bell & Anderson, 2010; Zhang & Ness, 2010).

[3]The fixed effects models were estimated in STATA version 10 using the XTREG command as follows: XTREG Y X, FE VCE(CLUSTER, STATE_ID), where Y = dependent variable, X = set of independent variables (including dummy variables for time), FE = fixed effects estimator, and VCE(CLUSTER, STATE_ID) = use White's (1984) procedure to obtain consistent standard errors to correct for autocorrelation.

(*PctPost4Yr*, *PctPost4YrI*, *PctPost4YrO*), S_i = state indicator variables with fixed effects α, T_t = time indicator variables with fixed effects β, SES_{it} = set of socioeconomic control variables (*MedianY*, *PctBA*) with coefficients δ, DEM_{it} = set of demographic control factors (*PctBlack*, *PctHisp*) with coefficients γ, λ_1 to λ_7 = effects of alternative measures of state financial support for higher education on the college-going rate or migration rate, and u = random error term.

Several studies in the literature have included public tuition rates as an independent variable in the analysis. Although price seems to be an obvious choice for an explanatory variable in this type of model, we opted to exclude tuition for several reasons. First, because economic models often treat "price" and "quantity" as being determined simultaneously, the inclusion of tuition on the right-hand side of equations (1) through (4) would be inappropriate. Second, the in-state tuition rates at public institutions are, almost by definition, negatively correlated with the level of state appropriations, as legislatures provide funding to public institutions in part to reduce tuition rates for state residents. Accordingly, controlling for tuition and appropriations would not allow us to capture the total impact of appropriations on student enrollment. Finally, tuition rates may also be correlated with other forms of state financial assistance. Because the models control for state fixed effects, the coefficients on the other variables in the model are interpreted as the effects of changes in the variables within states on the postsecondary decisions of students.

The four models differ in how we tested for the impacts of state financial support on student postsecondary decisions. In Model 1, we controlled for the per-capita level of total financial support and the percentages of funding in the form of need-based and merit-based grants. This model allows us to focus on changes in the level of total funding within states and on the relative mix of funding given to need- and merit-based grants. Model 2 was the same as Model 1, except that we dropped the two variables for percentage funding and replaced the total state funding variable with the three per-capita funding variables for appropriations, need-based grants, and merit-based grants. Doing so allowed us to directly compare the impacts of incremental per-student dollar increases in each type of funding on student decisions about postsecondary education.

Models 3 and 4 used a difference-in-difference approach to determine whether the introduction of a broad-based merit aid program affected the college-going behavior of students. Model 3 was the same as Model 1 except that we replaced the percentage funding variables with a dummy variable for whether the state had a broad-based, merit aid program in place. The model enables us to determine if, holding constant the level of total financial support for higher education in a state, whether the introduction of a broad-

based merit-aid program led to changes in student postsecondary decisions. Finally, in Model 4 we added the dummy variable for broad-based merit aid programs to Model 2 to determine if increases in the size of a state's total merit aid programs, as measured by dollars per capita, had a significant effect on students after taking into account the creation of a broad-based merit aid program.[4] In all four models, the state-level fixed effects allowed us to capture the net impact of other factors that would also be thought to impact access or migration but which could not be measured and/or were constant within each state over the sample period.

Due to the time-series nature of the data, it was likely that the results from the fixed effects models would be affected by autocorrelation. Bertrand, Duflo, and Mullainathan (2004) assert that the standard errors in panel data studies can be biased downward due to autocorrelation, and that the vast majority of panel data studies they reviewed did not attempt to correct for this problem. To test for autocorrelation, we relied on the procedure developed by Wooldridge (2002) and summarized by Drukker (2003) for panel data. The test for autocorrelation was conducted by first-differencing all of the variables, regressing the first difference in *Y* against the first differences of the explanatory variables in the model, and then regressing the residuals from the first-difference model against their lagged values to determine if the coefficient was statistically different from -0.50. In all instances, we were able to reject the null hypothesis of no autocorrelation ($p < .01$), and thus concluded that adjustments needed to be made for autocorrelation. We then corrected for autocorrelation by obtaining consistent standard error estimates using a procedure originally developed by White (1984). We implemented the procedure in STATA using the cluster command option for the fixed effects model. In simulations, Bertrand, Duflo, and Mullainathan (2004) found that this approach was the most effective at properly adjusting the standard errors in panel data.[5]

---

[4]We also estimated several other model specifications that are not shown in this article. The first alternative model added the variable for the presence of broad-based merit aid programs to Model (1). The second alternative model was a variant of Model (2) where we dropped the variable *FinM* and added the dummy variable *BBMerit*. The results from these model variations were very similar to those shown in this study.

[5]The procedure recommended by Bertrand, Duflo, and Mullainathan (2004) is to obtain asymptotically consistent standard error estimates through the variance-covariance matrix in the model. This procedure is an extension of the approach developed by White (1984) to address heteroscedasticity in cross-sectional studies when the form of heteroscedasticity is unknown. We made the corrections in STATA by using the cluster command and identifying the states as the clusters of interest. Bertrand, Duflo, and Mullainathan (2004) showed that this approach produced more reliable results than attempts to parametrically estimate the degree of autocorrelation within panels. More details on the alternatives for correcting autocorrelation in panel data can be found in Bertrand, Duflo, and Mullainathan (2004).

Drawing on theory and empirical studies, we anticipated a number of findings across the various models. Beginning with the socioeconomic status of a state, a sizable literature has shown that students from low socioeconomic backgrounds have lower levels of educational attainment than their peers from higher socioeconomic backgrounds (Alexander, Pallas, & Holupka, 1987; Blau & Duncan, 1967; Hearn, 1984; Hossler, Schmit, & Vesper, 1999; Hout, Raftery, & Bell, 1993; McDonough, 1997; Walpole, 2003). Accordingly, we posited that gains in a state's socioeconomic status, as measured by *MedianY* and *PctBA,* would have a direct effect on the demand for higher education. With regard to race/ethnicity, many studies have examined the connections between race/ethnicity and educational attainment (Dynarski, 2002b; Hurtado, Inkelas, Briggs, & Rhee, 1997; Jackson, 1990; Kane, 1994; Kane & Spizman, 1994; Morgan, 1996; Perna, 2000; Rivkin, 1995; Roscigno, 1998, 1999, 2000; St. John & Noell, 1989). Although descriptive statistics have shown that college participation rates are lower for Blacks and Hispanics relative to Whites, Perna (2000) notes: "The extent to which college enrollment behaviors vary across racial/ethnic groups after controlling for other variables is equivocal" (p. 120). Therefore, it is not clear a priori whether changes in the percentages of Blacks and Hispanics in a state would lead to changes in the college enrollment rates or migration of students.

Turning to the state financial support variables, if raising the overall level of state financial assistance for higher education within a state (*Fin*) is helpful at increasing the state's college-going rate, then we should find that it has a positive effect ($\lambda_1 > 0$) on overall college participation. The separate effects of changes in appropriations, need-based grants, and merit-based grants in states on access and migration, however, may vary in sign and strength across the various models. Because appropriations cannot be used at institutions outside of the state's boundaries, it is reasonable to expect that they will be more likely to increase the percentage of students going to an in-state college and reduce the percentage of students going out-of-state. The effect of need-based grants on access to higher education, however, is also likely to be influenced by factors such as the portability of aid, the size of the typical award relative to in-state tuition, and the income threshold used for determining aid eligibility.

With regard to merit-based grants, if the state dollars are primarily given to students who would likely attend college without the aid, then conventional wisdom holds that their impact on the overall college-going rates should be smaller than need-based grants. The effect of merit aid on access to higher education may also depend on factors such as the size of financial awards, the level of academic performance needed to qualify for the grant, and the institutions where the merit aid can be applied to tuition and fees. And as suggested by Dynarski (2004), if students increase their academic perfor-

mance to qualify for broad-based merit aid, then these programs could lead to increases in overall college enrollment rates.

Finally, it is possible that the findings from the models would differ depending on whether the dependent variable includes enrollments in only four-year institutions or in all postsecondary institutions (Rouse, 1994). Four-year institutions typically charge higher tuition rates than their two-year counterparts, and thus a subsidy that covers the same percentage of tuition would have a larger dollar reduction for students attending four-year versus two-year institutions. Appropriations per capita are likely to vary across institutions within states, thus leading to further differences in impacts on students. Likewise, merit-based and need-based grants may have different restrictions on whether the aid can be used at two-year institutions. We anticipated few differences in the results for out-of-state four-year institutions and all institutions because most students who migrate to other states for postsecondary education enroll in four-year institutions.

RESULTS

In Table 1 we present descriptive statistics for the variables used in this study when the data are pooled across states and years. Beginning with the six dependent variables, the results show that the average percentage of high school graduates going to any two-year or four-year institution was 55.7%, while slightly less than 40% of all students attended a four-year institution. Roughly four-fifths of all college students, and 71% of students attending four-year institutions, opted to attend institutions in their home state. The vast majority of students who migrated to other states for their postsecondary education attended four-year institutions. Each of these six measures of college attendance exhibited substantial variation across states and time.

The descriptive statistics for the socioeconomic measures *PctBA* and *MedianY* and the demographic factors *PctBlack* and *PctHisp* also showed considerable differences across the states and/or time. The state funding measures revealed that the average amount of financial assistance per capita from all sources was $2,826 (in 2008 dollars), which represented slightly more than half of the average price of attending an in-state flagship institution. Not surprisingly, the vast majority of state financial assistance was in the form of appropriations to designated public institutions. Not only were the average per capita grant figures small in absolute terms, but the maximum values within the period under examination would cover only a small fraction of the price of attendance at in-state public institutions.

Table 2 shows what happened to the average college-going rate and the state migration rate during the 1988–2008 period. The data revealed that the overall college participation rates of graduating high school seniors rose by 18 percentage points over this 20-year period, with about one-third of the

Table 2

Trends in Average College-Going Rates and State Migration, 1988–2008

Year	*All Postsecondary Institutions*			*Four-Year Postsecondary Institutions*		
	PctPost	*PctPostI*	*PctPostO*	*PctPost4Yr*	*PctPost4YrI*	*PctPost4YrO*
1988	44.3%	35.3%	9.1%	30.7%	22.7%	8.0%
1992	52.5%	40.7%	11.8%	36.7%	26.0%	10.7%
1994	55.2%	42.6%	12.7%	38.9%	27.3%	11.6%
1996	56.7%	43.5%	13.2%	40.2%	28.2%	12.0%
1998	56.8%	43.8%	13.0%	40.5%	28.5%	12.0%
2000	56.7%	43.6%	13.1%	40.7%	28.7%	12.1%
2002	55.9%	43.3%	12.6%	40.2%	28.7%	11.6%
2004	56.1%	44.0%	12.1%	39.8%	28.7%	11.1%
2006	61.2%	47.6%	13.6%	43.5%	31.0%	12.5%
2008	62.1%	48.8%	13.3%	43.5%	31.3%	12.3%

Notes: There are 500 observations for each variable. *PctPost* = percentage of graduating high school seniors attending any two-year or four-year postsecondary institution. *PctPostI* = percentage of graduating high school seniors attending any in-state two-year or four-year postsecondary institution. *PctPostO* = percentage of graduating high school seniors attending any out-of-state two-year or four-year postsecondary institution. *PctPost4Yr* = percentage of graduating high school seniors attending any four-year postsecondary institution. *PctPost4YrI* = percentage of graduating high school seniors attending any in-state four-year postsecondary institution. *PctPost4YrO* = percentage of graduating high school seniors attending any out-of-state four-year postsecondary institution. High school seniors include public and private schools during the previous 12 months.

Table 3

Trends in State Financial Assistance for Higher Education, 1988-2008

Year	*Fin*	*FinA*	*FinN*	*FinM*	*PctN*	*PctM*	*BBMerit*
1988	$2,640	$2,558	$73	$9	2.9%	0.3%	0
1992	$2,642	$2,549	$82	$11	3.3%	0.4%	0
1994	$2,713	$2,597	$98	$19	3.7%	0.7%	1
1996	$2,775	$2,653	$101	$20	3.7%	0.7%	3
1998	$2,909	$2,768	$113	$29	3.9%	1.0%	7
2000	$2,940	$2,779	$117	$43	4.0%	1.4%	10
2002	$2,803	$2,617	$123	$63	4.5%	2.1%	12
2004	$2,776	$2,577	$133	$66	5.0%	2.1%	14
2006	$3,040	$2,819	$145	$76	5.2%	2.2%	16
2008	$3,023	$2,789	$155	$80	5.6%	2.4%	16

Notes: There are 500 observations for each variable. *Fin* = total state financial assistance per capita ages 18–24 for higher education. *FinA* = state appropriations per capita ages 18–24. *FinN* = state need-based grants per capita ages 18–24. *FinM* = state merit-based grants per capita ages 18–24. *PctN* = percentage of total state funding in need-based grants. *PctM* = percentage of total state funding in merit-based grans. *BBMerit* = number of states with broad-based merit-aid programs. All financial variables are adjusted for inflation (2008 dollars).

TABLE 4

CORRELATIONS OF SELECTED VARIABLES, 1988–2008

Variable	*PctPost*	*PctPostI*	*PctPostO*	*PctPost4Yr*	*PctPost4YrI*	*PctPost4YrO*
Fin	0.19	0.24	-0.10	-0.08	-0.01	-0.09
FinA	0.12	0.18	-0.10	-0.16	-0.08	-0.11
FinN	0.30	0.14	0.19	0.35	0.18	0.23
FinM	0.19	0.30	-0.19	0.15	0.31	-0.18
PctN	0.24	0.04	0.26	0.37	0.14	0.29
PctM	0.17	0.29	-0.20	0.15	0.32	-0.19
BBMerit	0.16	0.25	-0.15	0.07	0.20	-0.15

Notes: There are 500 observations for each variable. *PctPost* = percentage of students attending any postsecondary institution. *PctPostI* = percentage of students attending any in-state postsecondary institution. *PctPostO* = percentage of students attending any out-of-state postsecondary institution. *PctPost4Yr* = percentage of students attending any four-year postsecondary institution. *PctPost4YrI* = percentage of students attending any in-state four-year postsecondary institution. *PctPost4YrO* = percentage of students attending any out-of-state four-year postsecondary institution. *Fin* = total state financial assistance per capita for higher education. *FinA* = state appropriations per capita. *FinN* = state need-based grants per capita. *FinM* = state merit-based grants per capita. *PctN* = percentage of total state financial assistance in the form of need-based grants. *PctM* = percentage of total state financial assistance in the form of merit-based grants. *BBMerit* = 1 if the state had a broad-based merit aid program for the year in question, 0 otherwise. All correlations of ±0.06 or higher were statistically significant at the 5% level.

gain coming in the last five years. The increase in four-year college participation rates was also substantial but smaller for this period, with rates rising from 30.7% in 1988 to 43.5% in 2008. Interestingly, most of the increase in student outmigration occurred prior to the time when many states adopted broad-based merit aid programs.

In Table 3, the first three columns contain data on the average levels of state financial assistance per capita by form (appropriations, need-based grants, merit-based grants) and year. All figures are in constant (2008) dollars per capita ages 18–24 and are averaged across states. The next two columns in the table show the percentages of total state funding that were made for need-based grants and merit-based grants, respectively. Finally, the last column reports the number of states in each year that had a broad-based merit aid grant program.

It can be seen in Table 3 that total state financial support per capita for higher education and appropriations per capita increased slightly over this time period even after adjusting for inflation. Alternatively, state grants (both need-based and merit-based) rose at a faster pace than appropriations throughout the 20-year period that we considered. Nonetheless, the level of per-capita funding for state grants remained fairly small overall in comparison to appropriations, with about 8% of total state support in 2008 coming in the form of grants.

TABLE 5

FIXED EFFECTS MODELS EXPLAINING PERCENTAGE OF STUDENTS GOING TO COLLEGE, 1988 TO 2008

Variable	*Attend Any Postsecondary Institution (Y=PctPost)*				*Attend Four-Year Postsecondary Institution (Y=PctPost4Yr)*			
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 1*	*Model 2*	*Model 3*	*Model 4*
MedianY	-7.349	-7.868	-10.298	-9.877	-15.947	-15.452	-17.576	-16.546
	(20.723)	(20.758)	(19.901)	(19.919)	(14.387)	(14.546)	(13.912)	(14.111)
PctBA	0.249*	0.249*	0.294*	0.293*	0.181	0.180	0.206*	0.204*
	(0.121)	(0.121)	(0.124)	(0.125)	(0.094)	(0.094)	(0.089)	(0.089)
PctBlack	-0.089	-0.087	-0.092	-0.092	-0.070	-0.070	-0.072	-0.073
	(0.065)	(0.065)	(0.064)	(0.064)	(0.053)	(0.053)	(0.053)	(0.053)
PctHisp	-0.015	-0.016	-0.017	-0.017	0.006	0.005	0.005	0.005
	(0.135)	(0.135)	(0.131)	(0.130)	(0.116)	(0.116)	(0.116)	(0.115)
Fin	2.134*	—	1.789*	—	0.779	—	0.586	—
	(0.875)		(0.880)		(0.452)		(0.474)	
FinA	—	1.981*	—	1.615	—	0.576	—	0.377
		(0.890)		(0.897)		(0.431)		(0.457)
FinN	—	-0.832	—	1.504	—	2.448	—	3.721
		(8.815)		(8.886)		(4.477)		(4.684)
FinM	—	14.452**	—	8.003	—	6.542*	—	3.031
		(3.882)		(4.655)		(2.925)		(3.530)
PctN	-0.078	—	-0.004	—	0.036	—	0.077	—
	(0.284)		(0.280)		(0.142)		(0.145)	
PctM	0.398**	—	0.168	—	0.176	—	0.049	—
	(0.131)		(0.171)		(0.096)		(0.114)	
BBMerit	—	—	3.345	3.267*	—	—	1.848	1.778
			(1.664)	(1.608)			(1.361)	(1.328)
R-Squared	0.512	0.513	0.521	0.521	0.506	0.561	0.566	0.566

Table 5, cont.

Notes: All models also include nine dummy variables for year and fixed effects for state. Sample size = 500 for all models. Standard errors are shown in parentheses and were corrected for autocorrelation using White's (1984) procedure. *PctPost* = percentage of students attending any postsecondary institution. *PctPost4Yr* = percentage of students attending any four-year postsecondary institution. *MedianY* = median household income. *PctBA* = percentage of adult population with a bachelor's degree or higher. *PctBlack* = percentage of state population ages 18–24 who are Black. *PctHisp* = percentage of state population ages 18–24 who are Hispanic. *Fin* = total state financial assistance per capita for higher education. *FinA* = state appropriations per capita. *FinN* = state need-based grants per capita. *FinM* = state merit-based grants per capita. *PctN* = percentage of total state financial assistance in the form of need-based grants. *PctM* = percentage of total state financial assistance in the form of merit-based grants. *BBMerit* = dummy variable equal to 1 if the state had a broad-based merit aid program in the year in question, 0 otherwise. ** $p < .01$, * $p < .05$.

Table 4 shows how the state financial variables under consideration in our study were correlated with the six measures of college attendance. As in Table 1, the data were pooled across states and years. All correlations of ±0.06 or higher were statistically significant at the 5% significance level. We found that all of the measures of state financial support were positively correlated with the overall college-going rate and the percentages of students staying in-state for college. The data showed that appropriations and merit-based grants were negatively correlated with the percentage of students migrating to other states. At the same time, need-based grants were positively correlated with outmigration. The same general patterns held true when we considered attendance in only four-year institutions, except that appropriations were found to be negatively correlated with the percentage of students attending any four-year institution or staying in-state for college.

Although the findings in Tables 1–4 are interesting, they are limited in two respects. First, the univariate statistics do not take into account the effects of other factors on access to postsecondary education and migration across state lines. Second, because the data were pooled across states, the figures ignore the panel nature of the dataset. Accordingly, Tables 5 through 7 contain the main results from the fixed effects models that we estimated. In Table 5, we estimated Models 1–4 for the two measures of overall college attendance (*PctPost* and *PctPost4Yr*). This approach was repeated for the two measures of in-state college attendance (*PctPostI* and *PctPost4YrI*) in Table 6, and we likewise applied the equations to out-of-state migration (*PctPostO* and *PctPost4YrO*) in Table 7. In all three tables, the results were corrected for first-order serial correlation as described in the previous section.

Starting with Table 5, the findings showed that, after taking into account the other variables in the model and the panel nature of the dataset, increases in the educational attainment of adults within states led to gains in the percentage of students going to college. We did not find a similar relationship

TABLE 6

FIXED EFFECTS MODELS EXPLAINING PERCENTAGE OF STUDENTS STAYING IN-STATE FOR COLLEGE, 1988 TO 2008

Variable	*Attend Any Postsecondary Institution (Y=PctPostI)*				*Attend Four-Year Postsecondary Institution (Y=PctPost4YrI)*			
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 1*	*Model 2*	*Model 3*	*Model 4*
MedianY	8.477	7.508	5.051	5.103	0.463	0.498	-1.545	-0.919
	(20.930)	(21.052)	(19.668)	(19.717)	(14.487)	(14.695)	(13.663)	(13.828)
PctBA	0.112	0.111	0.164	0.164	0.065	0.064	0.096	0.095
	(0.130)	(0.129)	(0.138)	(0.138)	(0.112)	(0.111)	(0.110)	(0.109)
PctBlack	-0.015	-0.012	-0.019	-0.018	0.001	0.002	-0.001	-0.001
	(0.066)	(0.066)	(0.065)	(0.065)	(0.051)	(0.051)	(0.050)	(0.050)
PctHisp	-0.004	-0.007	-0.006	-0.008	0.014	0.011	0.012	0.011
	(0.143)	(0.142)	(0.138)	(0.137)	(0.123)	(0.123)	(0.122)	(0.122)
Fin	2.588**	—	2.181*	—	1.204**	—	0.966*	—
	(0.834)		(0.847)		(0.400)		(0.412)	
FinA	—	2.431**	—	1.993*	—	1.008*	—	0.750
		(0.877)		(0.891)		(0.403)		(0.406)
FinN	—	-0.266	—	2.532	—	2.212	—	3.860
		(8.893)		(8.976)		(4.536)		(4.699)
FinM	—	17.286**	—	9.564	—	9.831**	—	5.282
		(4.358)		(5.077)		(3.148)		(3.813)
PctN	-0.061	—	0.026	—	0.024	—	0.075	—
	(0.295)		(0.290)		(0.149)		(0.150)	
PctM	0.500**	—	0.233	—	0.289*	—	0.132	—
	(0.145)		(0.182)		(0.110)		(0.134)	
BBMerit	—	—	3.887*	3.911*	—	—	2.277	2.304
			(1.738)	(1.675)			(1.467)	(1.411)
R-Squared	0.407	0.407	0.423	0.423	0.413	0.413	0.426	0.427

Table 6, cont.

Notes: All models also include nine dummy variables for year and fixed effects for state. Sample size = 500 for all models. Standard errors are shown in parentheses and were corrected for autocorrelation using White's (1984) procedure. *PctPost* = percentage of students attending any postsecondary institution. *PctPost4Yr* = percentage of students attending any four-year postsecondary institution. *MedianY* = median household income. *PctBA* = percentage of adult population with a bachelor's degree or higher. *PctBlack* = percentage of state population ages 18–24 who are Black. *PctHisp* = percentage of state population ages 18–24 who are Hispanic. *Fin* = total state financial assistance per capita for higher education. *FinA* = state appropriations per capita. *FinN* = state need-based grants per capita. *FinM* = state merit-based grants per capita. *PctN* = percentage of total state financial assistance in the form of need-based grants. *PctM* = percentage of total state financial assistance in the form of merit-based grants. *BBMerit* = dummy variable equal to 1 if the state had a broad-based merit aid program in the year in question, 0 otherwise. ** $p < .01$, * $p < .05$.

for changes in median household income within states. For race/ethnicity, we found no connection between changes in the percentage of Blacks or Hispanics ages 18–24 within states and the percentage of students going to college.

With regard to state financial support for higher education, the data showed that, as states increased their investments in postsecondary education, more students went to college. For example, the coefficient for the variable *Fin* in Model 1 indicates that, for each additional $1,000 per capita a state invested in higher education, the proportion of students going to college rose by approximately 2.1 percentage points. The results for Model 1 in column 5, however, were not significantly associated with attendance patterns in four-year institutions.

When we broke down total per-capita state financial support into its three main components (Model 2), we found that increases within states in both appropriations and merit-based grants had positive and significant effects on the overall college-going rates. The point estimate of the effect of increases in per-capita merit-based grants was substantially greater than that for appropriations. For example, the coefficients in Model 2 suggest that a $1,000 increase in a state's per-capita merit-based grants would lead to an increase of 14.5 percentage points in overall college attendance rates and an increase of 6.5 percentage point in four-year college attendance rates for that state. A similar picture emerged when we looked at the percentage of state funding allocated toward grants (Model 1), except that changes in the percentage of state aid in the form of merit-based grants was not statistically significant for four-year institutions. In contrast, across all models we found no evidence of an association between increases in need-based grants within states and college attendance.

Taken together, the results suggest that, when states divert appropriations toward merit-based grants, but not need-based grants, it would lead to gains in the college-going rates of graduating high school seniors. We found that

the effect of this reallocation was smaller when we considered only attendance at four-year institutions. The evidence was mixed with regard to whether the creation of broad-based merit aid programs led to increases in college attendance. The estimated coefficient was statistically significant in only one of the four models at $p < 0.05$.

In Table 6, we repeated the analysis except that the dependent variables were the percentages of students who chose to attend any in-state institution or any four-year in-state institution. The results for in-state college attendance by and large mirrored what we found for overall college attendance, which is not surprising given that the vast majority of college-bound students attended in-state institutions. Neither increases in the median household income nor the educational attainment level of adults within states had significant effects on the percentage of graduating high school seniors who attended an in-state institution. Increases in the percentage of Blacks and Hispanics in a state led to no significant changes in the in-state college attendance rate for both four-year institutions and all institutions.

The results for state financial support of higher education revealed that changes in total per-capita funding, appropriations per capita, and merit-based per-capita grants within states all had positive and statistically significant effects on the percentage of graduating seniors choosing to attend an institution in their state of residence. The estimated impact of states increasing their merit-based grants was again substantially larger than the impact of appropriations. Across all of the models, we found no evidence that increases in need-based grants within states had an impact on the percentage of students staying in-state for college. Both the introduction of a broad-based merit aid program and the per-capita dollars allocated to merit aid had positive and significant effects on the percentage of students attending any in-state institution.

Finally, in Table 7 we focused on the impact of state higher education financing on student outmigration. Beginning with the socioeconomic measures, the data showed that increases in the percentage of adults with a bachelor's degree within states had a positive and significant effect on the percentage of high school graduates choosing to go out-of-state for college. We also found that outmigration fell as the median household income within states increased. This somewhat counterintuitive result is attributed to the fact that, in the fixed effects model, the impact of differences in median household income across states is removed from the coefficient estimate.

A one-way analysis of variance demonstrated that there was statistically significant variation in average household incomes across states. As another test, we reestimated the four models shown in Table 7 without controlling for state-level fixed effects and found that median family income had a positive and significant impact on the percentage of students going out of

TABLE 7

FIXED EFFECTS MODELS EXPLAINING PERCENTAGE OF STUDENTS GOING OUT-OF-STATE FOR COLLEGE, 1988 TO 2008

Variable	*Attend Any Postsecondary Institution (Y=PctPostO)*				*Attend Four-Year Postsecondary Institution (Y=PctPost4YrO)*			
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 1*	*Model 2*	*Model 3*	*Model 4*
MedianY	-15.826**	-15.376*	-15.348*	-14.980*	-16.410**	-15.950**	-16.031**	-15.627**
	(5.719)	(5.806)	(5.741)	(5.708)	(5.509)	(5.619)	(5.510)	(5.493)
PctBA	0.137*	0.138*	0.130*	0.129*	0.116*	0.116*	0.110	0.109
	(0.052)	(0.052)	(0.055)	(0.056)	(0.055)	(0.055)	(0.058)	(0.059)
PctBlack	-0.074**	-0.075**	-0.073**	-0.074**	-0.071**	-0.072**	-0.070**	-0.071**
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
PctHisp	-0.011	-0.009	-0.010	-0.009	-0.007	-0.006	-0.007	-0.006
	(0.034)	(0.034)	(0.033)	(0.033)	(0.030)	(0.030)	(0.029)	(0.029)
Fin	-0.449*	—	-0.393	—	-0.425*	—	-0.380	—
	(0.215)		(0.213)		(0.207)		(0.206)	
FinA	—	-0.450	—	-0.378	—	-0.432	—	-0.373
		(0.230)		(0.226)		(0.227)		(0.223)
FinN	—	-0.567	—	-1.028	—	0.236	—	-0.140
		(1.880)		(1.923)		(1.858)		(1.890)
FinM	—	-2.833*	—	-1.560	—	-3.288*	—	-2.251
		(1.253)		(1.591)		(1.243)		(1.605)
PctN	-0.018	—	-0.030	—	0.012	—	0.002	—
	(0.065)		(0.066)		(0.061)		(0.062)	
PctM	-0.102*	—	-0.065	—	-0.113**	—	-0.083	—
	(0.041)		(0.053)		(0.038)		(0.050)	
BBMerit	—	—	-0.542	-0.645	—	—	-0.429	-0.525
			(0.544)	(0.531)			(0.471)	(0.467)
R-Squared	0.524	0.521	0.527	0.526	0.543	0.547	0.551	0.550

Table 7, cont.

Notes: All models also include nine dummy variables for the year and fixed effects for the state. Sample size = 500 for all models. Standard errors are shown in parentheses and were corrected for autocorrelation using White's (1984) procedure. *PctPost* = percentage of students attending any postsecondary institution. *PctPost4Yr* = percentage of students attending any four-year postsecondary institution. *MedianY* = median household income. *PctBA* = percentage of adult population with a bachelor's degree or higher. *PctBlack* = percentage of state population ages 18–24 who are Black. *PctHisp* = percentage of state population ages 18–24 who are Hispanic. *Fin* = total state financial assistance per capita for higher education. *FinA* = state appropriations per capita. *FinN* = state need-based grants per capita. *FinM* = state merit-based grants per capita. *PctN* = percentage of total state financial assistance in the form of need-based grants. *PctM* = percentage of total state financial assistance in the form of merit-based grants. *BBMerit* = dummy variable equal to 1 if the state had a broad-based merit aid program in the year in question, 0 otherwise. ** $p < .01$, * $p < .05$.

state for college. The percentage of students migrating to other states fell as the percentages of the population ages 18–24 that were Black increased within states. Turning to the state financial variables, as the total per-capita financial support for higher education increased within states, students were less likely to go out of state for college. This relationship, however, was due solely to the rise in merit-based grants within states (Models 1 and 2). The introduction of a broad-based merit aid program in a state did not by itself lead to a decline in outmigration.

Summary

The manner in which states provide financial support for higher education is an important topic for policymakers who seek to use finances to increase the number of students who obtain a college education, stay in-state, and in turn improve the quality of life in the region. Even though several options could be used to reach these goals, the majority of research studies on this topic have focused solely on need-based or merit-based grants. To address this issue, we examined the effects of all three forms of state financial support on access to higher education and the retention of students in-state. The panel data approach that we implemented here allowed us to use state-level data to more precisely model the effects of changes in aid and other factors within states on the percentage of students who go on to college than would be possible using only cross-sectional or time-series data. The fixed effects approach also enabled us to control for the net effect of unobservable and constant state-level factors that influence demand for higher education.

Our results showed that increases in the overall level of state financial support within states had a positive and significant impact on access to higher education and on reducing migration across state lines. Raising appropriations within states was effective at enticing more state residents to go

to college. Increases in merit-based grants within states were shown to have even larger effects than appropriations on improving the college-going rate in states, and they also reduced student migration. These findings were, by and large, consistent with the literature on state financial aid, although no study we have found compared the dollar impacts of merit-based grants to state appropriations.

In contrast, we found no evidence that increases in funding for need-based grants within states led either to gains in the college-going rates of students or to reduced outmigration. This result is markedly different from the results that St. John et al. (2006) found in their study but is in line with the mixed consensus from research on need-based grants. One limitation of state-level analyses such as ours for examining the effects of need-based aid is that most of the large need-based grant programs such as New York's Tuition Assistance Program (1961), the Pennsylvania State Grant Program (1966), and the Washington State Need Grant Program (1970), were created prior to the first year of our analysis. As a result, it is possible that the introduction of these programs led to gains in college participation in earlier years and that these effects are now incorporated into the overall state effect. Nonetheless, our findings demonstrate that, during the past 20 years, when states increased their levels of need-based aid, they did not translate into further gains in access to higher education or reductions in out-of-state migration for college.

Taken together, the results should give state policymakers reason to consider moving away from the traditional high appropriations/low aid approach to financing to make higher education more accessible to residents. The fact that merit-based grants have substantially greater impacts than appropriations shows that policymakers should explore the use of broad-based merit aid programs as a way to improve access to higher education. At the same time, increasing appropriations within states can lead to gains in the college-going rates of students.

LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The results from this study add to the growing body of literature showing that broad-based merit aid programs deserve more attention and study. To some extent, these programs have been unfairly compared to other merit aid programs that target relatively few awards to students of very high academic ability and achievement. In reality, both broad-based merit aid programs and need-based grants are intended to make it possible for large numbers of students to receive a financial incentive to entice them to go to college. As noted by Delaney and Ness (2010), however, there are wide variations in the design aspects of broad-based merit aid programs. Virtually no research has been conducted to determine how factors such as the size of the grant,

the portability of the grant, the level of academic performance needed to receive the grant, and other factors influence the postsecondary decisions of high school students. Given the fact that, on average, broad-based merit aid program have large effects on students, it would be important to know exactly how different aspects of these programs translate into efficiency and equity gains for states. More research is also needed to determine whether these programs actually lead students to invest more time and effort in their schooling with the goal of raising their academic performance and earning a grant. However, national analyses may be unable to fully explore the unique characteristics of state-specific aid program design. Accordingly, state case studies could examine the extent to which changes in program design may impact enrollment, interstate migration, or other policy objectives.

We recognize that state policymakers may have competing goals for need- or merit-aid programs. Some may view aid as a tool for increasing participation for underrepresented students while others view aid as a mechanism for raising academic standards (Ehrenberg, Zhang, & Levin, 2006), enhancing economic growth, or reducing income inequality. However, we posit that some goals are consistent with one another, namely, providing aid to increase positive externalities within a state. Due to data limitations, we were unable to disaggregate enrollment or interstate migration levels by students' racial/ethnic characteristics or their socioeconomic status. Similarly, we were unable to control for statewide Advanced Placement (AP) scores, AP participation rates, or other measures of academic performance due to data unavailability. In St. John, Chung, Musoba, and Simmons's (2006) research, statewide high school academic variables failed to yield significant or positive relationships with college enrollment levels, suggesting that these controls may have accounted for little variation in our model. Further research could examine how the design of aid programs impacts alternative policy goals.

Studies in the literature have also been hampered by lack of data on key factors that theory would suggest may impact student postsecondary decisions. Despite the theoretical connection between benefits from going to college and the decision to invest in higher education, studies of student demand for higher education rarely use good measures of financial benefits from going to college. Other factors that can affect the private cost of investing in human capital, such as financial support from institutions, private sources, and other governmental levels, are equally difficult to obtain at the state level and thus are not incorporated into these studies. More work needs to be done to measure these factors and determine if and how they affect the findings in these models. The problem may require the use of different research designs, such as student-level and institutional-level studies or investigations of fewer states where such information can be obtained.

DISCUSSION AND CONCLUSION

It is imperative that policymakers and educators begin to take a different look at the various approaches that states can be used to financially support higher education. Arguments over the "best" approach to financing can quickly become very ideological and political (Doyle, 2007b; Dynarski, 2002b; Ehrenberg, Zhang, & Levin, 2006; Heller & Marin, 2002; St. John, Chung, Musoba, & Simmons, 2006). For a variety of reasons, discussions of state policy tend to be driven by advocates for each of the three forms of financial assistance. Many college administrators, for example, like the fact that appropriations are a stable source of revenue that they can use to help meet their goals and objectives and would be concerned that need-based and merit-based grant programs might replace some of this revenue source.

Policymakers may not appreciate the fact that these options can be viewed as three different approaches to essentially the same problem: how to use scarce funds to generate positive externalities for the state. The argument for state appropriations is that this goal is best accomplished by making tuition at public institutions within state boundaries as low as possible. In this way, students and their families will not be dissuaded from pursuing college because they think it is unaffordable (Johnstone, 2005). In addition, the lower in-state tuition reduces the relative price of attending an in-state institution, making it more favorable for all residents to stay in-state for college. Proponents of need-based financial aid counter that the best way to increase the college-going rate (and generate positive externalities) is to direct funding to those who are least likely to be able to afford to go to college without financial assistance. Finally, merit aid advocates contend that incentives are needed to not only encourage qualified students to go to college, but also to help students work harder in high school (and thus become qualified to go to college) and to reduce the migration of high-ability students.

Discussions about which form of aid is "best" should also recognize the different goals and objectives of the agencies that provide the funding. Postsecondary education is a highly subsidized enterprise, with financial support coming from the federal government, state governments, private foundations such as the Gates Foundation, and individual donors. Each of these entities can be thought of as providing financial support either to students or institutions to help reach a goal or objective. If the entities have different goals and objectives, then they will likely need different financing strategies to achieve them. For example, colleges and universities may prefer merit-based grants over need-based grants because merit-based grants help them achieve their goal of maximizing their prestige or reputation, which is influenced by the profile of students attending institutions. Private foundations that seek to reduce gaps in college-participation rates by race/ethnicity or socioeconomic status are more likely to prefer grants targeted to specific students than to

appropriations or merit-based grants. And states will be more concerned than the federal government or private foundations with designing aid programs that help keep students—and the positive externalities that accompany them—in-state. The tendency, however, is for some policymakers to apply a one-size-fits-all approach to financial aid and judge federal, state, institution, and private aid programs by a single criterion such as whether they help equalize college-participation rates by socioeconomic status.

By viewing these three state funding options as being related to the same goal and recognizing that the state's goal can be different from the goals of other entities that also support higher education, policymakers may eventually move beyond their ideological and political perspectives and design strategies that can capture the best aspects of each approach for states to achieve their goal. It is hoped that this result will then set the stage for future research into the ways in which all of the levels of financial support for higher education work together.

Appendix

Variable Definitions

Variable	*Description*	*Sources*
PctPost	Percentage of high school graduates from the previous 12 months who were attending any two-year or four-year postsecondary institution. Includes only degree-granting, Title IV eligible institutions.	Enrollment data were obtained from *Digest of Education Statistics* for 1992–2008 and IPEDS for 1988. High school graduate data were obtained from WICHE.
PctPostI	Percentage of state high school graduates from the previous 12 months who were attending any two-year or four-year in-state postsecondary institution. Includes only degree-granting, Title IV eligible institutions.	Enrollment data were obtained from *Digest of Education Statistics* for 1992–2008 and IPEDS for 1988. High school graduate data were obtained from WICHE.
PctPostO	Percentage of state high school graduates from the previous 12 months who were attending any two-year or four-year out-of-state postsecondary institution. Includes only degree-granting, Title IV eligible institutions.	Enrollment data were obtained from *Digest of Education Statistics* for 1992–2008 and IPEDS for 1988. High school graduate data were obtained from WICHE.
PctPost4Yr	Percentage of high school graduates from the previous 12 months who were attending any four-year postsecondary institution. Includes only degree-granting, four-year, Title IV eligible institutions.	Enrollment data were obtained from *Digest of Education Statistics* for 1992–2008 and IPEDS for 1988. High school graduate data were obtained from WICHE.
PctPost4YrI	Percentage of state high school graduates from the previous 12 months who were attending any four-year in-state postsecondary institution.	Enrollment data were obtained from *Digest of Education Statistics* for 1992–2008 and IPEDS for 1988. High school graduate data were obtained from WICHE.

	Includes only degree-granting, four-year, Title IV eligible institutions.	
PctPost4YrO	Percentage of state high school graduates from the previous 12 months who were attending any four-year out-of-state postsecondary institution. Includes only degree-granting, four-year, Title IV eligible institutions.	Enrollment data were obtained from *Digest of Education Statistics* for 1992–2008 and IPEDS for 1988. High school graduate data were obtained from WICHE.
PctBA	Percentage of adults (25 years+) whose highest degree is a bachelor's degree or higher.	U.S. Census Bureau
MedianY	Median household income by state and year. Figure is adjusted for inflation (base year = 2008).	U.S. Census Bureau
PctBlack	Percentage of state residents ages 18–24 who are Black	U.S. Census Bureau
PctHisp	Percentage of state residents ages 18–24 who are Hispanic	U.S. Census Bureau
Fin	Total state financial support for higher education. Figure is adjusted for inflation (base year = 2008) and expressed on a per-capita basis (population ages 18–24). Computed as *FinA*+*FinN*+*FinM*.	Derived from other variables
FinA	State higher education tax fund appropriations. Figure is adjusted for inflation (base year = 2008) and expressed on a per-capita basis (population ages 18–24).	Grapevine

Appendix, cont.

Variable	*Description*	*Sources*
FinN	Total need-based state grant aid to college students. Figure is adjusted for inflation (base year = 2008) and expressed on a per-capita basis (population ages 18–24).	National Association of State Scholarship and Grant Aid Programs
FinM	Total non-need-based grant aid to college students. Figure is adjusted for inflation (base year = 2008) and expressed on a per-capita basis (population ages 18–24).	National Association of State Scholarship and Grant Aid Programs
PctN	Percentage of total state financial assistance given in need-based grants. Computed as *FinN*/*Fin.*	Derived from other variables
PctM	Percentage of total state financial assistance given in merit-based grants. Computed as *FinM*/*Fin.*	Derived from other variables

References

Adkisson, R., & Peach, J. (2008). Non-resident enrollment and non-resident tuition at land grant college and universities. *Education Economics, 16,* 75–88.

Alexander, K., Pallas, A., & Holupka, S. (1987). Consistency and change in educational stratification: Recent trends regarding social background and college access. *Research in Social Stratification and Mobility, 6,* 161–185.

Baryla, E., & Dotterweich, D. (2001). Student migration: Do significant factors vary by region? *Education Economics, 9,* 269–280.

Baryla, E., & Dotterweich, D. (2006). Institutional focus and non-resident student enrollment. *International Journal of Educational Management, 20,* 239–248.

Becker, G. (1975). *Human capital: A theoretical and empirical analysis, with special reference to education.* Chicago: University of Chicago Press.

Becker, W. (1990). The demand for higher education. In S. Hoenack and E. Collins (Eds.), *The economics of American universities: Management, operations, and fiscal environment.* (pp. 155–188). New York: State University of New York Press.

Becker, W. (2003). *Omitted variables and sample selection problems in studies of college-going decisions.* Paper presented at the Mini-Conference on Evaluation Methods and Practices Appropriate for Faith-Based and Other Providers of Social Services, Bloomington, IN.

Bell, A., & Anderson, R. (2010). *State merit aid curricular criteria: Policy alignment and promoting college readiness.* Working paper, West Virginia Higher Education Policy Commission.

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics, 119,* 249–275.

Blau, P., & Duncan, O. (1967). *The American occupational structure.* New York: John Wiley & Sons.

Blundell, R., Dearden, L., Goodman, A., & Reed, H. (2000). The returns to higher education in Britain: Evidence from a British cohort. *The Economic Journal, 110,* 82–99.

Bound, J., & Turner, S. (2007). Cohort crowding: How resources affect collegiate attainment. *Journal of Public Economics, 91,* 877–899.

Calhoun, J., & Kamerschen, D. (2010). The impact of governing structure on the pricing behavior and market structure of public institutions of higher education in the U.S. *International Review of Economics, 57,* 317–333.

Cellini, S. (2008). Causal inference and omitted variable bias in financial aid research. *Review of Higher Education, 31,* 329–354.

College Board (2010). *Trends in college pricing.* Washington, DC: The College Board.

Cornwell, C., Mustard, D., & Sridhar, D. (2006). The enrollment effects of merit-based financial aid: Evidence from Georgia's HOPE program. *Journal of Labor Economics, 24,* 761–786.

Creedy, J., & Francois, P. (1990). Financing higher education and majority voting. *Journal of Public Economics, 43,* 181–200.

Curs, B., & Singell, L. (2002). An analysis of the application and enrollment processes for in-state and out-of-state students at a large public university. *Economics of Education Review, 21,* 111–124.

Dee, T. (2003). *Are there civic returns to education?* NBER Working Paper 9588. Cambridge, MA: National Bureau of Economic Research. Retrieved August 23, 2010, from http://www.cib.espol.edu.ec/Digipath/D_Papers/47212.pdf.

Delaney, J., & Ness, E. (2010). *A state-level merit aid typology.* Working paper, Vanderbilt University, Nashville, TN.

DesJardins, S., Ahlburg, D., & McCall, B. (2006). An integrated model of application, admission, enrollment, and financial aid. *The Journal of Higher Education, 77,* 381–429.

DesJardins, S., & McCall, B. (2006). *The impact of the Gates Millennium Scholars program on the college enrollment, borrowing, and work behavior of low-income minority students.* A report to the Bill and Melinda Gates Foundation.

DesJardins, S., & McCall, B. (2009, November). *The impact of Washington State Achievers Scholarship on student outcomes.* Paper presented at the annual meeting of the Association for the Study of Higher Education, Vancouver, BC.

Dotterweich, D., & Baryla, E. (2005). Non-resident tuition and enrollment in higher education: Implications for tuition pricing. *Education Economics, 13,* 375–385.

Doyle, W. (2006). The policy adoption of state merit aid programs: An event history analysis. *Educational Evaluation and Policy Analysis, 28,* 259–285.

Doyle, W. (2007a). *The politics of public college tuition and state financial aid.* Working paper. Peabody College, Vanderbilt University.

Doyle, W. (2007b). The political economy of redistribution through higher education subsidies. In J. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 22, pp. 335–409). Dordrecht, The Netherlands: Springer.

Drukker, D. (2003). Testing for serial correlation in linear panel-data models. *The Stata Journal, 3,* 168–177.

Dynarski, S. (2000). Hope for whom? Financial aid for the middle class and its impact on college attendance. *National Tax Journal, 53,* 629–661.

Dynarski, S. (2002a). The behavioral and distributional implications of subsidies for college. *American Economic Review, 92,* 279–285.

Dynarski, S. (2002b). Race, income, and the impact of merit aid. In D. Heller & P. Marin (Eds.), *Who should we help? The negative social consequences of merit aid scholarships* (pp. 73–92). Cambridge, MA: Harvard Civil Rights Project.

Dynarski, S. (2004). The new merit aid. In C. Hoxby (Ed.), *College choices: The economics of where to go, when to go, and how to pay for it* (pp. 63–100). Chicago: The University of Chicago Press.

Ehrenberg, R., Zhang, L., & Levin, J. (2006). Crafting a class: The trade-off between merit scholarships and enrolling lower-income students. *Review of Higher Education, 29,* 195–211.

Goldrick-Rab, S., Harris, D., & Trostel, P. (2009). Why financial aid matters (or does not) for college success: Toward a new interdisciplinary perspective. In J. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 24, pp. 1–45). Dordrecht, The Netherlands: Springer.

Grapevine (2010). *State support for higher education, fiscal years 2005, 2008, 2009, and 2010.* Retrieved August 19, 2010, from http://www.grapevine.ilstu.edu/tables/FY10/Revised_Feb10/GPV10_50state_dollars_revised_PDF.pdf.

Greene, K. (1994). The public choice of nonresident college tuition levels. *Public Choice, 78,* 231–240.

Greene, W. (1997). *Econometric analysis.* Upper Saddle River, NJ: Prentice-Hall.

Groen, J. (2004). The effect of college location on migration of college-educated labor. *Journal of Econometrics, 121,* 125–142.

Groen, J., & White, M. (2004). In-state versus out-of-state students: The divergence of interest between public universities and state governments. *Journal of Pubic Economics, 88,* 1793–1814.

Hearn, J. (1984). The relative roles of academic, ascribed, and socioeconomic characteristics in college destinations. *Sociology of Education, 57,* 22–30.

Hearn, J., & Longanecker, D. (1985). Enrollment effects of alternative postsecondary pricing policies. *Journal of Higher Education, 56,* 485–508.

Heller, D. (1997). Student price response in higher education: An update to Leslie and Brinkman. *Journal of Higher Education, 68,* 624–659.

Heller, D. (1999). The effects of tuition and state financial aid on public college enrollment. *The Review of Higher Education, 23,* 65–89.

Heller, D. (2006). State support of higher education: Past, present, and future. In D. Priest & E. St. John (Eds.), *Privatization and public universities* (pp. 11–37). Bloomington: Indiana University Press.

Heller, D., & Marin, P. (Eds.). (2002). *The negative social consequences of merit scholarships.* Cambridge, MA: The Civil Rights Project at Harvard University.

Hossler, D., Schmit, J., & Vesper, N. (1999). *Going to college: How social, economic, and educational factors influence the decisions students make.* Baltimore: Johns Hopkins University Press.

Hout, M., Raftery, A., & Bell, E. (1993). Making the grade: Educational stratification in the United States, 1925–1989. In Y. Shavit & H. Blossfeld (Eds.), *Persistent inequality: Changing educational attainment in thirteen countries* (pp. 25–48). Boulder, CO: Westview Press.

Hurtado, S., Inkelas, K., Briggs, C., & Rhee, B. (1997). Differences in college access and choice among racial/ethnic groups: Identifying continuing barriers. *Research in Higher Education, 38,* 43–75.

Ionescu, F., & Polgreen, L. (2009). A theory of brain drain and public funding for higher education in the United States. *American Economic Review, 99,* 517–521.

Jackson, G. (1990). Financial aid, college entry, and affirmative action. *American Journal of Education, 98,* 523–550.

Jackson, G., & Weathersby, G. (1975). Individual demand for higher education: A review and analysis of recent empirical studies. *Journal of Higher Education, 46,* 623–652.

Johnstone, B. (2005). Financing higher education: Who should pay? In P. Altbach, R. Berdahl, & P. Gumport (Eds.), *American higher education in the twenty-first century: Social, political, and economic challenges* (pp. 369–392). Baltimore, MD: Johns Hopkins University Press.

Kane, T. (1994). College entry by Blacks since 1970: The role of college costs, family background, and the returns to education. *Journal of Political Economy, 102,* 878–911.

Kane, T. (2003). *A quasi-experimental estimate of the impact of financial aid on college-going.* Working paper 9703, National Bureau of Economic Research. Retrieved August 19, 2010, from http://www.nber.org/papers/w9703.

Kane, T., & Spizman, L. (1994). Race, financial aid awards, and college attendance: Parents and geography matter. *American Journal of Economics and Sociology, 53,* 73–97.

Kodrzycki, Y. (2001). Migration of recent college graduates: Evidence from the National Longitudinal Survey of Youth. *New England Economic Review, 1,* 13–34.

Koshal, R., & Koshal, M. (2000). State appropriations and higher education tuition: What is the relationship? *Education Economics, 8,* 81–89.

Kyung, W. (1996). In-migration of college students to the state of New York. *Journal of Higher Education, 67,* 349–358.

Leslie, L., & Brinkman, P. (1987). Student price response in higher education: The student demand studies. *Journal of Higher Education, 58,* 181–204.

Long, B. (2004). Does the format of a financial aid program matter? The effect of state in-kind tuition subsidies. *The Review of Economics and Statistics, 86,* 767–782.

Mak, J., & Moncur, J. (2003). Interstate migration of college freshmen. *The Annals of Regional Science, 37,* 603–612.

McDonough, P. (1997). *Choosing colleges: How social class and schools structure opportunity.* New York: SUNY Press.

McHugh, R., & Morgan, J. (1984). The determinants of interstate student migration: A place-to-place analysis. *Economics of Education Review, 3,* 269–278.

Mixon, F. (1992). Factors affecting college student migration across states. *International Journal of Manpower, 13,* 25–32.

Mixon, F., & Hsing, Y. (1994a). College student migration and human capital theory: A research note. *Education Economics, 2,* 65–73.

Mixon, F., & Hsing, Y. (1994b). The determinants of out-of-state enrollments in higher education: A tobit analysis. *Economics of Education Review, 13,* 329–335.

McMahon, W. (2009). *Higher learning, greater good: The private and social benefits of higher education.* Baltimore, MD: Johns Hopkins University Press.

Mincer, J. (1958). Investment in human capital and personal income distribution. *The Journal of Political Economy, 66,* 281–302.

Moretti, E. (2004). Estimating the social return to higher education: Evidence from longitudinal and repeated cross-sectional data. *Journal of Econometrics, 121,* 175–212.

Morgan, S. (1996). Trends in Black-White differences in educational expectations, 1980–1992. *Sociology of Education, 69,* 308–319.

National Center for Education Statistics (selected years). *Digest of Education Statistics.* Washington, DC: U.S. Department of Education.

Noorbakhsh, A., & Culp, D. (2002). The demand for higher education: Pennsylvania's nonresident tuition experience. *Economics of Education Review, 21,* 277–286.

Orsuwan, M., & Heck, R. (2009). Merit-based student aid and freshman interstate college migration: Testing a dynamic model of policy change. *Research in Higher Education, 50,* 24–51.

Paulsen, M. (2001). The economics of the public sector: The nature and role of public policy in the finance of higher education. In M. Paulsen & J. Smart (Eds.). *The finance of higher education: Theory, research, & practice* (pp. 95–132). New York: Agathon Press.

Perna, L. (2000). Differences in the decision to attend college among African Americans, Hispanics, and Whites. *The Journal of Higher Education, 71,* 117–141.

Perna, L., & Titus, M. (2004). Understanding differences in the choice of college attended: The role of state public policies. *Review of Higher Education, 27,* 501–525.

Perry, K. (2001). *Where college students live after they graduate.* Washington, DC: National Center for Government Statistics.

Rivkin, S. (1995). Black/White differences in schooling and employment. *Journal of Human Resources, 30,* 826–852.

Rizzo, M. (2006). State preference for higher education spending: A panel data analysis, 1977–2001. In R. Ehrenberg (Ed.), *What's happening to public higher education? The shifting financial burden* (pp. 3–36). Baltimore, MD: The Johns Hopkins University Press.

Rizzo, M., & Ehrenberg, R. (2004). Resident and nonresident tuition and enrollment at flagship state universities. In C. Hoxby (Ed.), *College choices: The economics of where to go, when to go, and how to pay for it* (pp. 303–354). Chicago: The University of Chicago Press.

Roscigno, V. (1998). Race and the reproduction of educational disadvantage. *Social Forces, 76,* 1033–1060.

Roscigno, V. (1999). The Black-White achievement gap, family school links, and the importance of place. *Sociological Inquiry, 69,* 159–1986.

Roscigno, V. (2000). Family/school inequality and African-American/Hispanic achievement. *Social Problems, 47,* 266–290.

Rouse, C. (1994). What to do after high school: The two-year versus four-year college enrollment decision. In R. Ehrenberg (Ed.), *Choices and consequences: Contemporary policy issues in education* (pp. 59–88). New York: IRL Press.

Schultz, T. (1961). Investment in human capital. *American Economic Review, 51,* 1–17.

St. John, E., Chung, C., Musoba, G., & Simmons, A. (2006). Financial access. In E. St. John (Ed.), *Education and the public interest: School reform, public finance, and access to higher education* (pp. 83–114). Dordrecht, The Netherlands: Springer.

St. John, E., & Noell, J. (1989). The effects of student financial aid on access to higher education: An analysis of progress with special consideration of minority enrollments. *Research in Higher Education, 30,* 563–581.

Toutkoushian, R., & Shafiq, M. (2010). A conceptual analysis of state support for higher education: Appropriations versus need-based financial aid. *Research in Higher Education, 51,* 40–64.

Van der Klaauw, W. (2002). Estimating the effect of financial aid offers on college enrollment: A regression-discontinuity approach. *International Economic Review, 43,* 1249–1287.

Venniker, R. (2000). *Social returns to education: A survey of recent literature on human capital externalities.* Tilburg, The Netherlands: CPB Netherlands Bureau for Economic Policy Analysis. Retrieved August 23, 2010, from http://center.uvt.nl/staff/smulders/gtlit/vennik00.pdf.

Walpole, M. (2003). Socioeconomic status and college: How SES affects college experiences and outcomes. *The Review of Higher Education, 27,* 45–73.

White, H. (1984). *Asymptotic theory for econometricians.* San Diego, CA: Academic Press.

Winston, G. (1999). Subsidies, hierarchy, and peers: The awkward economics of higher education. *The Journal of Economic Perspectives, 13,* 13–36.

Wooldridge, J. (2002). *Econometric analysis of cross section and panel data.* Cambridge, MA: MIT Press.

Zhang, L. (2007). Nonresident enrollment demand in public higher education: An analysis at national, state, and institutional levels. *Review of Higher Education, 31,* 1–26.

Zhang, L., & Ness, E. (2010). Does state merit aid stem brain drain? *Educational Evaluation and Policy Analysis, 32,* 143–165.